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ABSTRACT

Previous studies established that 6 hours of instruction focusing on cognitively demanding aspects of computer use were sufficient to reduce computer anxiety significantly among teacher education students. This paper reports on a study of whether or not it is possible to reduce anxiety at least as efficiently by providing a similar length computer experience that focuses on a less cognitively demanding experience. The sample included 154 preservice education majors at West Virginia University (Morgantown). One group of 59 education majors participated in the interactive video "Classroom Management Simulation," a simulation of four typical management problems. Another group of 96 students was enrolled in a mandatory Computer Awareness Module that is part of the Pre-Professional Skills Test required for admission into the university's teacher education program. Subjects completed a learning styles inventory and a measure of computer anxiety. Posttest anxiety scores for the simulation group were significantly lower than pretreatment anxiety, and the difference was greater than for the computer awareness group. No significant relationship was found between learning modality and computer anxiety, unsurprising since the simulation was expected to be equally effective for visual and auditory learners. Findings imply that computer anxiety may be more effectively reduced in a short time through an application that requires little knowledge about the computer itself. One table compares the pretreatment and posttreatment anxieties of the two student groups. (Contains 27 references.) (SLD)

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THE EFFECTS OF INSTRUCTIONAL CONTENT, BRIEF INSTRUCTIONAL ACTIVITIES, AND LEARNING MODALITY ON TEACHER EDUCATION STUDENTS' COMPUTER ANXIETY

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Introduction

Anxiety and Learning

A long recognized obstacle many students must overcome before being able to learn effectively is anxiety toward new materials, new teachers, or new technologies. Anxiety may be real, imagined, or learned (Wicks, 1977) and many people employ defense mechanisms such as repression, projection, denial, and rationalization to avoid situations they view as potentially anxious rather than learn to overcome their fears. These mechanisms impair learning. Wick also maintains that reassurance and learning can effectively reduce anxiety and, as a result, lessen its effects on learning. Microcomputers are one relatively new form of technology that has become commonplace in schools over the past two decades that can cause anxiety. Rohner and Simonson (1981) define computer anxiety as "the mixture of fear, apprehension, and hope that people feel when planning to interact or when actually interacting with a computer" (p. 551) and is experienced by as many as one third of student users (Howard, Murphy & Thomas, 1987; Loyd & Gressard, 1984). Therefore, determining the best ways to teach about and with computers is important (Cambre & Cook, 1985).

Computer Anxiety

Computer anxiety is often considered to be a temporary condition that can easily be altered through computer use in an environment carefully constructed to address anxiety (Torris, 1985). A number of researchers have found that experience with computers results in a negative relationship with computer anxiety, aptitude, literacy, and interest (Honeyman, & White, 1987; Liu, Reed & Phillips, 1990; Marcoulides, 1988). Others have established that learning about computers reduces computer anxiety from as little time as six hours (Overbaugh and Reed, 1990; Overbaugh and Reed, [in press]) to 36 hours (Reed & Palumbo, 1987/88) to 60 hours (Honeyman and White, 1987).

Rationale and Research Questions

Teacher Education Students and Computer Education

Computers have become an integral part of all educational environments and have been shown to be effective across all grade levels and subject matters (Roblyer, Castine, & King, 1988). However, many beginning teacher education candidates have little or no experience with computers. For example, Liu, Reed, and Phillips (1990), utilized a scale developed by Reed and Palumbo (1987/88) that categorizes previous computer experience into four categories that lie on a continuum from no experience to the most cognitively demanding computer use: (a) no experience, (b) computer assisted instruction (CAI), (c) computer managed instruction (CMI), and (d) programming languages. Based on these four categories, Liu, Reed and Phillips found that approximately one third of the pre-service teachers had no computer experience and only an additional one fifth had experience with computer assisted instruction (CAI), the least cognitively demanding type of computer use. Therefore, an important facet of teacher education is to prepare pre-service and inservice teachers to effectively integrate computer based and computer assisted instruction into their curriculum. Interestingly, the most important application of computers for practicing teachers and their students is as tools to help with administrative tasks or Computer Managed Instruction (CMI) first and to help teach content or Computer Assisted Instruction (CAI) second (Bozeman & Spuck, 1991; Snyder, 1993; Woodrow, 1991). With this in mind, the path to computer literacy for educators should begin with the utilization of computer management tools, but an initial concern should be to find and provide the most efficacious way to overcome the initial anxiety experienced by those with little or no computer experience in order for them to learn about computers more efficiently.

Brief Instruction to Reduce Computer Anxiety

This study is the fourth in a series of investigations involving pre-service teacher candidates. All studies have examined student characteristics that have an effect on computer anxiety and ways to reduce computer anxiety in a brief (six hour) period. The first study showed that a six-hour, one-day (Saturday), hands-on Computer Awareness Module that concentrated primarily on two aspects of educational computing: (a) an overview of computers in education

focusing on computer terminology, computer assisted instruction (CAI), computer managed instruction (CMI), and computer architecture and (b) introductory BASIC programming was sufficient to significantly reduce pre- service teacher education students' levels of computer anxiety (Overbaugh & Reed, 1990). The second study, conducted and reported in conjunction with the first, investigated the effects of instructional format on computer anxiety by comparing the same computer module delivered in either (a) a one-day format or (b) a three-day format. Students enrolled in the one-day format received all instruction on a single Saturday whereas those in the three-day format received instruction over three two-hour sessions, one each week for three consecutive weeks. Interestingly, in constrast to the first study, the one-day format students did not significantly reduce their computer anxiety whereas the three-day format did. Therefore, one of the reasons we conducted the third study was to determine which findings in the first two were accurate. That is, is six hours sufficient instructional time to reduce computer anxiety? We found that both groups did significantly reduce their anxiety, thus establishing that six hours is an adequate length of time for reducing computer anxiety (Overbaugh & Reed, [in press]).

Instructional Content and Computer Anxiety

Having established that six hours is a sufficient amount of time to reduce computer anxiety, a logical follow up is to investigate other ways to reduce anxiety as efficiently as the Computer Awareness Modules in the same amount of time by varying the instructional content. The rationale remains the same as in the previous three studies: if a minimal amount of instruction can significantly reduce computer anxiety, then later computer based instruction can focus on content, rather than building time into the instruction to alleviate computer anxiety. As mentioned before, the primary focus of the Computer Awareness Module is educational computing and programming in BASIC which places the bulk of the instruction in the two most cognitively demanding categories of Reed and Palumbo's (1987/88) previous-experience continuum. Therefore, if six hours of instruction which concentrates on the more cognitively demanding aspects of computer use can significantly reduce computer anxiety, then it may also be possible to reduce anxiety at least as efficiently by providing a similar length computer experience focused on a less cognitively demanding experience.

Research Questions

Several West Virginia University teacher education classes participated in an interactive video program that simulates four typical classroom management problems. The program is a computer assisted instruction (CAI) application, designed to take approximately six hours to complete. The role of the computer in this learning situation is that of a simple tool, or vehicle, with which to deliver instruction. The learning experience can therefore be classified as the least cognitively demanding *computer* experience on the Reed-Palumbo (1987/88) continuum (the lowest category is no experience). Thus, the first research question is, **What effect does a six-hour interactive video computer based instruction module have on computer anxiety?**

Because students often do not learn new material presented in a modality different from their own as well as when the modality of presentation is the same (Barbe & Milone, 1980; Kirby, Moore & Schofield, 1988), and learning is a primay way to overcome anxiety (Wicks, 1977), the second research question is, **What is the relationship between learning style and computer anxiety?** The hypothesis is that there will not be any relationship because the treatment (interactive video simulation) presents the instructional content in both an auditory and visual manner.

An important aspect of the simulation is the user interface. The Macintosh platform was selected because of its simple, intuitive, easy-to-use graphic interface. The simulation requires only the mouse to "point and click" for program navigation and, when users input text via the keyboard in response to computer-generated questions, the cursor is automatically placed in the correct location in the text window. As expected, a large portion of the sample had little or no computer experience and virtually none had Macintosh experience, but there were no instances in which anyone had any difficulty interacting with the simulation. The simplicity of the user interface, the fact that the simulation is an example of computer assisted instruction (CAI)—the lowest computer experience category, and the similarity of the sample with the Computer Awareness Module sample provides a good comparison of different instructional content within a

similar time frame. Thus, the third research question is, **What effect does computer based instruction content have on computer anxiety?**

Design of the Study

Sample

The sample (N = 154) in this study consisted of two similar groups of pre-service education majors at West Virginia University. The first group (n = 59), was students enrolled in their first curriculum and instruction class which participated in the interactive video *Classroom Management Simulation* as part of their regularly scheduled class and the second group (n = 96) was students enrolled in an educational psychology course who also enrolled in a separate but mandatory Computer Awareness Module that is part of the Pre-Professional Skills Test required for admission into the teacher education program. A total of 206 students were involved in the study but 51 were dropped because (a) they did not complete both the voluntary pre-instruction and post-instruction instruments—42, (b) the learning style inventory indicated dual learning modalities—6, (c) the learning style inventory indicated kinesthetic—2, or (d) a student missed more than 50 minutes of instruction—1. Because intact classes were used, random assignment to one of the groups was not possible.

Independent Variables

Treatment. The *Classroom Management Simulation* treatment consists of an interactive video program that simulates four typical ninth-grade classroom management problems: (a) a student enters the classroom after work has begun without offering an explanation or late slip, (b) a student refuses to pick up the crumpled paper he has strewn around his desk, insolently replying "No!" when told to do so by the teacher, (c) an English student sneaks back to her math after being told not to, and (d) a noisy, unruly class that must be brought under control in order to begin instruction. The program was originally developed and produced by the University of Alberta (Classroom discipline, 1987) as a level 2 interactive video program for a machine that is no longer available. The overall structure of the simulation and video footage was quite good so it was

rewritten by the researcher, based on a synthesis of computer-based instruction design principles (Overbaugh, 1991), to become level three.

The broad objective of the simulation is to teach eight basic classroom management principles—(a) fairness, (b) consistency, (c) firmness, (d) courtesy, (e) flexibility, (f) trust, (g) respect, and (h) humor—by providing explanations, examples, application, and practice in the near-to-real environment made possible by interactive video. In each scenario, an opening film clip is played that presents one of the four classroom problems. After the clip is played, the user is asked to describe what is happening and what he/she will do to solve the problem. Once a course of action to solve the problem is decided upon, the user selects the program option that most closely matches his/her choice and is then queried about his/her reason for making that particular choice. Then, based on the choice made, the program plays a possible resulting action by the video student(s). Because of the pedagogical soundness of teaching by counter example (Aronson & Briggs, 1983; Collins & Stevens, 1983; Jonassen & Hannum, 1987; Merrill, 1983) the simulation includes many choices, commonly believed effective by novice teachers, that lead to undesirable solutions. And, like real-life situations, once embarked on an undesirable course of action, users may not go back and change a previous course of action until the conclusion has been reached. However, a poor choice can often be overcome through subsequent choices leading to a positive conclusion. Depending on the choices made, this pattern is repeated up to five times which results in approximately 150 solutions to the four initial scenarios. Problem solutions proposed by users that are not part of the program are acknowledged and developed in a text-based environment.

The simulation group met initially for approximately one and one half hours to complete pre-test data forms and to learn about the simulation as well as to complete the introduction to the program which introduced the eight management principles through definitions and examples. Following the introductory session, the students worked in groups of two or three for five additional fifty-minute class meetings for a total on-task time of six hours. Post-test data was collected after the final session.

The portion of the sample comprised of the *Classroom Management Simulation* group was used to answer the first two research questions—**What effect does a six-hour interactive video computer based instruction module have on computer anxiety?** and **What is the relationship between learning style and computer anxiety?**

The Computer Awareness Module was designed to introduce students to computer terminology, educational uses of computers, and introductory programming in BASIC during three two-hour sessions followed by a one-hour test. The first session covered terminology, simple architecture, educational uses and operating skills. Introductory lo-resolution BASIC graphics programming was taught in the second session and beginning BASIC text programming was introduced in the third session. The Computer Awareness Module group was compared to the *Classroom Management Simulation* group to answer the third research question—**What effect does computer based instruction content have on computer anxiety?**

Content. The sample was blocked according to participation in either (a) the *Classroom Management Simulation* or (b) the Computer Awareness Module .

Learning modality. The subjects completed a learning styles inventory created by Barbe and Milone (1980). Permission to use the instrument was granted by Zaner-Blosser Incorporated, Columbus, Ohio. Test-retest reliability of the instrument in this study was .79. The sample was originally to be blocked as (a) auditory, (b) visual, or (c) kinesthetic, but since only two subjects were identified as kinesthetic, they were dropped, leaving only auditory and visual learning modalities. Six students were classified as having dual learning modalities—auditory and visual—were also dropped.

Dependent Measure

Computer Anxiety. Computer anxiety was measured by a version of the Spielberger (1972) *Self-Evaluation Questionaire* instrument modified by Reed and Palumbo (1987/1988) based on the findings of previous researchers. Maurer and Simonson (1984) found that the Spielberger instrument can accurately quantify computer anxiety if administered at an appropriate time. However, Price (1985) found that the instrument did not adequately identify computer anxiety between two groups of teachers, one of which had had computer instruction, because the

instrument was not worded to be computer specific and, therefore, could be interpreted in a general manner. Based partly on these studies, Reed and Palumbo modified the instrument to be computer specific. For example, an original question which read "I feel tense" was changed to " I feel tense when I work with a computer." The original format, a 20 question, four point Likert scale, was not changed. The modified instrument has been proven highly reliable (coefficient alpha = .91 and .93) (Reed & Palumbo).

Analysis and Results

The Effect of Interactive Video Simulation Instruction on Computer Anxiety

A paired *t*-test was conducted to compare the *Classroom Management Simulation's* pre-treatment computer anxiety with post-test computer anxiety. The post-test anxiety score was significantly lower than the pre-treatment anxiety score ($t(58) = 5.706$, $p = .0001$).

The Relationship Between Learning Modality and Computer Anxiety

A simple regression was performed between learning modality (visual vs. auditory) and level of post-treatment computer anxiety. There was not a significant linear relationship ($F(1,57) = 2.415$, $p = .1257$) indicating learning modality is not a reliable predictor of computer anxiety in the simulation treatment.

The Effect of Instructional Content on Computer Anxiety

An unpaired *t*-test was conducted to compare the pre-treatment computer anxiety of the two groups (*Classroom Management Simulation* and the Computer Awareness Module). There were no significant differences ($t(152) = -1.418$, $p = .1583$) so a second unpaired *t*-test was conducted to compare the post-treatment computer anxiety of the two groups. The *Classroom Management Simulation* group's computer anxiety (M = 39.22) was significantly lower ($t(152) = -2.381$, $p = .0185$) than the Computer Awareness Module's (M = 43.526).

Finally, because the simulation groups' computer anxiety was significantly reduced from the pre-treatment point to the post-treatment point, and was significantly less than the Computer Awareness Module group, a paired *t*-test was conducted to identify any change in computer anxiety of the Computer Awareness Module. They also significantly reduced their anxiety ($t(94) = 3.397$, $p = .001$).

Discussion

Learning Modality and Computer Anxiety

Based on the premise that interactive video will address the learning needs of both visual and auditory learners, and that learning structured in a manner designed to alleviate computer anxiety, the lack of a significant relationship between learning modality and computer anxiety is unsurprising. The simulation treatment was a combination of visual and auditory material and was expected to be equally effective for visual and auditory learners. Therefore, it would seem that the *Classroom Management Simulation* seemed to be equally effective in reducing computer anxiety for students in either learning modality.

Instructional Content and Computer Anxiety

The change in computer anxiety by the *Classroom Management Simulation,* like the previous studies involving only the Computer Awareness Modules, is encouraging because it once again shows that six hours is a sufficient length of time to significantly reduce computer anxiety levels. This study shows that, even though both the simulation and awareness groups' level of computer anxiety was not significantly different before the treatment, the simulation group had significantly lower anxiety than the awareness group after the treatment (see table 1). It should also be noted that both groups did significantly reduce their computer anxiety but the simulation group reduced theirs more (see table 1).

These findings imply that computer anxiety may be more effectively reduced in a short period of time through the use of an application that requires little knowledge about the computer itself than through a highly structured and concentrated survey of computer terminology, uses, architecture, and elementary programming. This implication also fits well with the notion that computers must become meaningful and useful to the individual as a personal tool before it will become useful as a means to help deliver information to others. In other words, the pre-service teachers involved in the *Classroom Management Simulation* utilized the computer as merely an easy-to-use medium through which they learned about classroom management. Because the user interface was so friendly, it might be considered almost transparent, or unnoticeable as a piece of technological equipment much as one ignores the simple mechanics of reading a book, using a

screwdriver, or using a television remote control. A learner in such an environment could conceivably overcome anxiety towards using what is often preconceived as a difficult-to-use machine quite easily because that very notion of difficulty is quickly dissipated. On the other hand, learners in the Computer Awareness Module were met with a barrage of information; a large portion of which lies outside their fields of experiences thus making learning more difficult and possibly anxious which may inhibit, somewhat, the reduction of anxiety toward the computer itself.

Table 1.

***Computer Anxiety of students enrolled in the* Classroom Management Simulation *and* Computer Awareness Module**

	Pre-Treatment	*Post-Treatment*	*Pre-Post Difference*
Classroom Management Simulation	44.39[1] (11.024)	39.22[1,2] (12.075)	5.17
Computer Awareness Module	47.158[2] (12.219)	43.526[1,2] (10.127)	3.632

1 = Pre-treatment students computer anxiety significantly higher than post-treatment
2 = Classroom Management Simulation's post-treatment computer anxiety significantly lower than Computer Awareness module's computer anxiety

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Conclusion

Learners in situations similar to that of the *Classroom Management Simulation* may quickly come to view the computer as a personally useful, simple tool to help them learn, whereas learners in situations like that of the Computer Awareness Module may remain somewhat anxious toward a machine about which they have learned quite a bit but have not had the opportunity to develop the dexterity needed to operate easily at a low level of cognitive engagement. Furthermore, the focus of the instruction should be considered. If the purpose of instruction is solely to reduce computer anxiety, then instruction using computers may be appropriate but, if the purpose is to reduce

anxiety *and* teach about computers, instruction about computers will accomplish both but may not reduce anxiety as much.

However, the findings in this study must be approached with caution. Whereas six contact hours have been repeatedly shown to significantly reduce computer anxiety the notion that an easy-to-use application in which the user interface is nearly transparent, while intuitively sensible, needs further investigation before any sort of global claim to the same effect can be proferred.

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